Vuoristo, Karri

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Effects of withholding value-added tax in Uganda

Karri Vuoristo*

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Abstract: The paper examines the effects of a value-added tax (VAT) withholding regime implemented in Uganda using administrative data from the Uganda Revenue Authority. By using modern two-way fixed effects models, the research estimates the dynamic effects and finds that firms increase their reported outputs by approximately 17.8 per cent and that the estimated value added increases by around 35 per cent. The study finds no effect on reported inputs and offers suggestive evidence that the positive effect found in outputs and value added might not be persistent across time. The implementation of VAT withholding shifts the responsibility for VAT remittance from suppliers to designated withholding agents, which functions on the assumption of higher compliance rates of large firms, financial institutions, and government bodies to address systemic challenges in VAT collection. This study addresses the broader question of how developing countries can enhance compliance in contexts characterized by weak enforcement and high levels of informality.

Key words: taxation, compliance, withholding value-added tax, third-party reporting, Uganda, Africa

JEL classification: H25, H26, H32, H71

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*Aalto University, Espoo, Finland and UNU-WIDER, Helsinki, Finland; email: **karri.vuoristo@aalto.fi**

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Mobilizing domestic revenue remains a fundamental challenge for developing countries, particularly in sub-Saharan Africa, where tax-to-GDP ratios are among the lowest globally. These low revenue levels limit governments' capacity to fund public services and infrastructure, key drivers of economic growth and societal well-being. Uganda exemplifies this struggle, with its VAT revenue constituting just 3.6 per cent of GDP in 2019 (UNU-WIDER 2023), compared to the OECD average of 7 per cent. Overall, Uganda is estimated to realize only 50 per cent of its tax revenue potential, with an overall tax-to-GDP ratio of 11.73 per cent in 2015, significantly lower than the global average of 18.1 per cent as estimated by Mawejje and Sebudde (2019). Compounding these issues are high levels of informality, weak enforcement capacity, and widespread non-compliance, particularly in value-added tax (VAT) reporting, where discrepancies are observed in nearly 79 per cent of cases (Almunia et al. 2024). Addressing these issues requires innovative tax policies that leverage existing systems while enhancing compliance and reducing evasion.

One such policy intervention is VAT withholding, which shifts the responsibility for VAT remittance from suppliers to designated withholding agents. This mechanism functions on the assumption of higher compliance rates of large firms, financial institutions, and government bodies to address systemic challenges in VAT collection. First introduced in Uganda in 2018, the initial implementation faced considerable resistance due to its burdensome withholding requirements, which created cash flow constraints for suppliers. Consequently, the policy was suspended after just a few months. In December 2021, the regime was reintroduced. The main change was a reduced withholding rate (33 per cent of the VAT amount instead of 100 per cent), which made compliance cheaper for the suppliers by reducing the negative cash flows associated with the withholding regime. This revision aimed to balance the need for improved compliance with the economic realities faced by firms in Uganda's low-enforcement environment (URA 2024, personal communication).

This paper evaluates the effects of Uganda's VAT withholding regime on firms' tax reporting behaviours, specifically focusing on reported taxable outputs, inputs, and value added of the supplier firms whose VAT was withheld. By examining the mechanisms of VAT withholding and its implementation in Uganda, this study addresses the broader question of how developing countries can enhance compliance in contexts characterized by weak enforcement and high levels of informality.

The empirical analysis employs a modern difference-in-differences (DiD) approach tailored to staggered treatment exposure and heterogeneous treatment effects (de Chaisemartin and D'Haultfœuille 2020, 2024), using firm-level administrative tax data from the Uganda Revenue Authority (URA). This dataset includes detailed monthly VAT returns and a host of firm registra-

tion variables, encompassing over 96,000 firms. By identifying firms exposed to the withholding regime—those supplying to the designated withholding agents—the analysis separates treated firms from a control group of non-affected firms. This categorization allows for a robust comparison of reporting behaviours before and after exposure to the regime.

The findings reveal significant and robust immediate effects of VAT withholding. Firms exposed to the regime increased their reported taxable outputs by approximately 17.8 per cent in the first month following treatment, corresponding to an average increase of UGX4.62 million (US$1,294). The estimated value added—the critical component for VAT calculation—rose by 35 per cent, representing an average increase of UGX7.72 million (US$2,162). However, these effects fall away almost immediately, suggesting that the intervention's impact may not be sustained without additional policy measures. Notably, no substantial changes were observed in reported inputs, suggesting that firms did not manipulate input values to offset the increased output reporting.

The Ugandan experience highlights both the potential and limitations of VAT withholding as a tool for improving compliance in low-capacity states. By leveraging third-party reporting, the policy enhances transparency and reduces opportunities for evasion (Carrillo et al. 2017). Yet its effectiveness depends on complementary reforms, including stronger enforcement mechanisms and supportive institutional structures (Bird and Gendron 2007; Keen 2009). This aligns with findings from similar studies in Zambia, which reported a 22 per cent increase in reported outputs following the implementation of a similar VAT withholding regime (Adu-Ababio et al. 2023).

Beyond its immediate contributions to tax compliance, VAT withholding has broader implications for governance and development. By expanding the tax base and increasing revenue collection, such policies can enhance the legitimacy and accountability of local governments, providing a foundation for sustained economic growth (North et al. 2009). However, the Ugandan case underscores the need for nuanced approaches that consider the constraints faced by firms and the revenue authority alike.

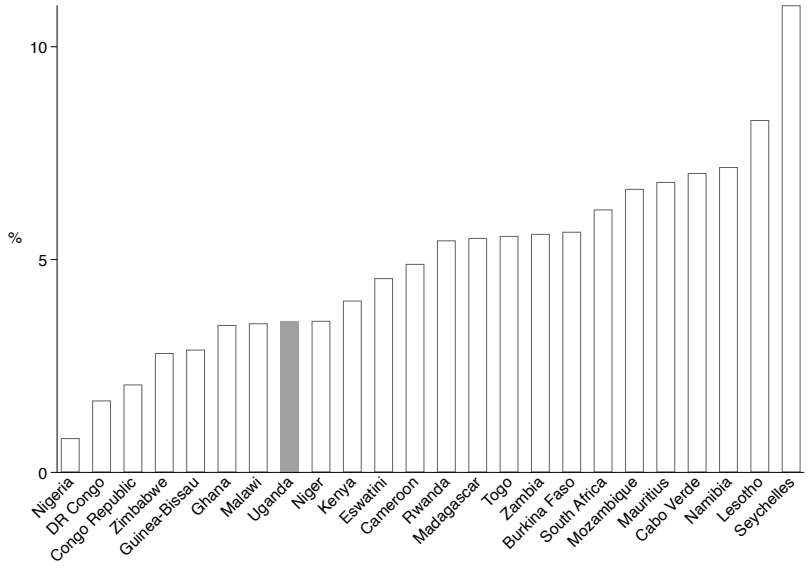
2 Institutional context

2.1 Uganda's taxation landscape and challenges

Uganda, like many sub-Saharan African countries, faces persistent challenges in mobilizing domestic revenue. Despite efforts to modernize tax administration, Uganda's tax-to-GDP ratio remains among the lowest in sub-Saharan Africa, with VAT revenue at only 3.6 per cent of GDP in 2019 compared to the OECD average of 7 per cent (Mawejje and Sebudde 2019; UNU-WIDER 2023). This low VAT revenue performance places Uganda on the lower end of

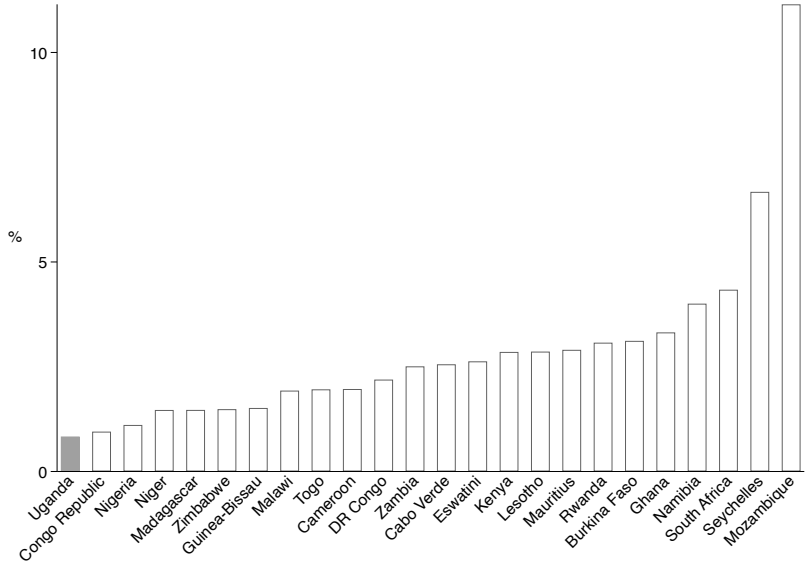
the spectrum regarding sub-Saharan Africa's VAT revenue as a percentage of GDP, as can be seen in Figure 1. For reference, the OECD average in 2021 was 7.0 per cent. Similarly, regarding corporate income tax revenue levels as a percentage of GDP in 2019 across sub-Saharan Africa, Uganda was the worst performer with a value of 0.8347, compared to the OECD average of 2.97 (Figure 2).

Figure 1: Value-added tax revenue (% GDP) in sub-Saharan Africa in 2019



Source: Author's compilation based on UNU-WIDER GRD data (UNU-WIDER 2023).

Figure 2: Corporate income tax revenue (% GDP) in sub-Saharan Africa in 2019



Source: Author's compilation based on UNU-WIDER GRD data (UNU-WIDER 2023).

The low levels of revenue mobilization reflect broader structural and institutional constraints, including high levels of informality, weak enforcement capacity, and widespread non-compliance. For example, discrepancies in VAT reporting are common. Almunia et al. (2024) find that in 79

per cent of cases, when reporting transactions for VAT filings, the buyers and sellers report different values. This illustrates significant discrepancies between the VAT reports and real-world transactions and underscores the difficulties Uganda faces in ensuring compliance with its tax system. Mawejje and Sebudde (2019) estimated that in 2015, Uganda realized only 50 per cent of its tax revenue potential, with an overall tax revenue of 11.73 per cent GDP, while the global average was 18.1 per cent GDP.

Compounding these issues is the legacy of Uganda's historical and institutional development. Uganda's colonial history as a 'cash-crop economy' created institutions that prioritized resource extraction over broader economic formalization (Mkandawire 2010). These historical factors have contributed to the current high levels of informality and low tax compliance, which pose significant barriers to effective revenue mobilization. Efforts to improve tax compliance must, therefore, contend with deep-rooted institutional and structural challenges. As Torgler et al. (2011) argue, underlying societal institutions significantly affect tax revenue potential, suggesting that these structures can hinder the effectiveness of new systems despite potentially robust implementation and enforcement efforts. While Uganda has served as a setting for some empirical studies on taxation more broadly, research focusing specifically on VAT in Uganda remains relatively scarce. A notable exception is the work by Almunia et al. (2024) examining misreporting characteristics using value-added tax returns. Their finding of frequent misreporting, with buyers and sellers reporting different values in as many as 79 per cent of transactions, is a cause for concern and highlights the challenges within Uganda's VAT system. As stated in their paper, Uganda is a low-enforcement context when it comes to taxes, which can confound findings regarding VAT returns until the reasons for this 'confused' action are better understood.

2.2 The VAT regime and introduction of withholding

VAT is a central pillar of Uganda's tax system, representing a significant share of domestic revenue. Introduced as part of broader tax reforms aimed at expanding the tax base, VAT has been implemented with varying degrees of success. While VAT has certain enforcement advantages—such as the value chain structure, which theoretically makes under-reporting more detectable—Uganda's low enforcement capacity has limited its effectiveness. Informality and misreporting remain pervasive, and administrative inefficiencies have further undermined the system's ability to collect revenue reliably. VAT withholding is one approach to address these challenges.

VAT withholding is a specific form of a broader tax withholding idea, which relies on so-called third-party reporting instead of first-party reporting. Withholding taxes refers to a tax collection system where the responsibility of reporting taxable values is moved from the tax-liable entity

to a third party (Carrillo et al. 2017). In the VAT context, withholding works by requiring pre-assigned withholding agents to remit VAT on their purchases, with these amounts then available as credit for the sellers (Keen 2009). Withholding aims to increase tax compliance and reduce informality. The mechanism allows for increased data collection as both the withholder and the withheld are required to report relevant values, enabling cross-referencing and making identification and enforcement easier for tax authorities.[1] It also aims to make tax evasion and active tax non-compliance harder as it may require collusion and increased communication between individuals.

In response to the challenges within its VAT system, Uganda introduced a VAT withholding regime to improve compliance. The first iteration of the regime was launched in July 2018, designating 680 withholding agents responsible for remitting VAT directly to the Uganda Revenue Authority on behalf of their suppliers (Ernst & Youg LLP 2018). This aimed to address non-compliance by shifting the reporting burden to larger, more compliant entities. However, the initial implementation faced significant pushback due to adverse cash flow effects on suppliers, as agents withheld the entire VAT amount (18 per cent of the taxable value), leaving suppliers unable to offset their input VAT immediately. Consequently, the policy was suspended after only a few months (Najjinda 2021). This quick reversal and the introduction of VAT withholding itself suggests a deeper issue: it can be interpreted as an implicit recognition that Uganda's VAT system was struggling to operate effectively on a foundation of self-assessment. As Bird and Gendron (2007) argue, while VAT inherently relies on self-assessment, a withholding regime signals an acknowledgement that tax administration cannot fully depend on it. No official statements of the reasons for the suspension were given. However, as the VAT return dates for suppliers and withholding agents were set on the same day, the crediting part of the value chain was possible only in the next tax period. This caused some cash flow constraints for the suppliers. Compounding this, if and when the transactions were conducted on credit, the withholding and VAT payments could sometimes be even further apart. (URA, personal communication, 24 May 2024)

A revised version of the VAT withholding regime was reintroduced in December 2021 with key modifications to address these issues. The withholding rate was reduced from 100 to 33 per cent of the VAT amount (from 18 to 6 per cent of the taxable value), significantly mitigating the cash flow impact on suppliers. The difference from the previous situation is that the agent would now withhold one-third of the VAT amount and pay the supplier the value of the goods or services and two-thirds of the VAT amount. This meant that the businesses trading with the withholding agents would experience a short-run loss, much smaller than in the previous revi-

[1] Formally, VAT reporting obligations for both suppliers and customers remain unchanged under withholding. However, withholding incentivizes suppliers, especially smaller entities, to report sales revenue accurately in order to recoup withheld VAT and claim corresponding input VAT credits. This can secondarily improve the reporting of input purchases, enhancing data availability for tax authorities.

sion. These changes aimed to balance the benefits of improved compliance with the need to minimize economic disruption and address some of the practical problems encountered in the first iteration.

The withholding agents were assigned based on being net payers of VAT and somewhat more reputable either by size or status, including organizations or firms such as non-governmental organizations, financial institutions, government statutory bodies, and other large taxpayers with a turnover above UGX10 billion and/or a net paid value of VAT of over UGX500 million (URA, personal communication, 24 May 2024).

2.3 Institutional barriers to compliance

The implementation of VAT withholding in Uganda highlights several institutional barriers to compliance. First, the high levels of informality in Uganda's economy mean that many businesses operate outside the formal tax net, limiting the reach of the VAT system. Second, weak enforcement capacity undermines the ability of the URA to detect and address non-compliance effectively. Third, corruption and inefficiencies within the tax administration exacerbate these challenges, eroding public trust in the system and further discouraging compliance (Jahnke 2017).

Despite these barriers, VAT withholding has shown potential as a tool to improve compliance. By leveraging third-party reporting, the regime increases the transparency of transactions and reduces opportunities for misreporting. However, as this paper will demonstrate, the effects of VAT withholding are not uniform across firms or sustained over time, underscoring the need for complementary reforms to strengthen Uganda's tax institutions.

2.4 WVAT results in Zambia

While VAT withholding has been implemented in other developing countries, empirical studies on the effectiveness of these regimes are scarce. Findings from an earlier study on this topic will be presented to establish a base understanding of expectations and provide a reference point before delving into the empirical parts of this paper. A study on the effects of implementing a VAT withholding regime in Zambia will be briefly discussed.

Zambia has had a VAT regime since 1995. From 2008 onwards, the VAT rate has been 16 per cent. As with most, if not all, implementations of VAT, it is not universal. There are exceptions and zero-rated supplies, which are quite common, along with different rates for products or supplies which the government has deemed harmful or beneficial for public health. Other political questions might influence VAT rates as well. VAT and taxation can and are being used

as a tool to direct consumption and the economy away and/or towards different products. The withholding regime was introduced in 2017 with a withholding rate of 100 per cent. In a study from 2023, Adu-Ababio et al. use a difference-in-differences approach to estimate the effects of the withholding regime. The authors estimate a 7.3 per cent increase in individual firms' VAT reporting if they had their VAT withheld and an aggregate effect of almost a 13 per cent VAT increase on a yearly level. Overall, the findings from Zambia were very positive. (Adu-Ababio et al. 2023)

2.5 Third-party reporting

One of the underlying mechanisms under VAT and, by extension, withholding VAT is called third-party reporting.[2] In essence, it means that reporting is done along with the normal two-party situation (consisting of the tax liable and the tax authority) by a third party, meaning either a buyer or seller of the good in question. The relatively recent success of third-party reporting stems from the advancements in information technology. Advances in computing allow revenue authorities to take in all the data they can think of to gather and process it in no time. This allows for cross-checking all of the tax reports against supplying and buying firms and with electronic payments becoming more common across the world, even against bank transactions to end users. In essence, the original way of tax audits relied heavily on the self-reported values on the tax returns. Auditing firms for misreporting was and still is a costly endeavour. However, the amount of data and the processing power have made it much cheaper and easier to screen firms and individuals for apparent non-compliance.

In addition to easier review processes, the fact that the subjects of taxation know about third-party reporting increases tax compliance. In an article by Adhikari et al. (2021), the authors studied the introduction of Form 1099-K in the United States, which allowed the revenue authority (the Internal Revenue Service or IRS) to access all the digital receipts of businesses. The introduction of this form made it clear to the businesses that all electronic transactions were known to the IRS. The authors used two groups subjected to Form 1099-K, one which was not covered by any information reporting requirements before the introduction of the form and another which was already subject to prior information reporting requirements. While at the aggregate level, the authors found no effect, when looking at smaller firms in commuting areas with higher use of payment cards, the effect of the form on reporting was economically and statistically significant.

While third-party reporting has been proven effective, Carrillo et al. (2017) argue that even though effective, there still exists an upper limit to the powers of third-party reporting. By ex-

[2] VAT withholding is a tool to address compliance. In a fully compliant scenario, withholding does not have an effect on third-party reporting, but if effective, withholding will increase the scope of third-party reporting.

ploiting a natural experiment in Ecuador, the authors present evidence that even in the presence of third-party reporting, firms can adjust their reporting on what the authors call 'less verifiable margins of the tax return'. The authors find that 24 per cent of firms report lower revenues than what their third-party reports would suggest. The study shows that when firms are notified about their misreporting, they fix their tax returns to correspond to the notified value. If the firm was not presented with a comparable value, the study shows they only increased their reported costs to hold the VAT liability the same. This is to say that, highlighted in the developing country context, third-party reporting is not an ultimate solution. As the system is not complete and every transaction is not reported, the firms are quick to adapt their behaviour by reporting increased costs from the margins which are not reported.

3 Data description

This paper uses data from the Uganda Revenue Authority. I combined two sources of administrative tax data: a monthly dataset of VAT returns (Uganda Revenue Authority 2023b) and a yearly dataset of corporate income tax reports (Uganda Revenue Authority 2023a). The datasets are connected via taxpayer identification numbers (TINs), which are anonymized by URA. The anonymization is done so that the different datasets have uniform TINs that can be merged.

The combined dataset is a firm–month panel, which includes the values for VAT calculations, including the amounts of withheld VAT and the amounts for VAT being withheld by firms. However, the data does not allow for matching withheld firms and the corresponding withholding agents. The dataset also includes descriptive variables and the yearly corporate income variables from the CIT dataset. The combined dataset allowed me to detect firms that have or have not been in business with withholding agents for the first or the second implementation of the VAT withholding regime in Uganda. Additionally, the combined dataset allows for descriptive statistics across the affected and unaffected firms (see Section 3.1 for more details), which helps to understand how and in which areas firms have been affected by the VAT withholding mechanism.

The VAT dataset, which is the primary source of the data, starts from January 2013 and has over 2 million observations (Tieu et al. 2023). On the other hand, the CIT panel is, as mentioned, a yearly panel. It starts from the financial year 2013/2014 and has around 30,000 to 54,000 yearly firms. In total, the data includes information on 96,798 unique firms and 311,004 unique firm-year observations. Table 1 describes the numbers and shares of firms in different ISIC (International Standard Industrial Classification of All Economic Activities) sectors.

Table 1: Share and number of firms in each sector (ISIC) present in the CIT dataset

	# of firms	% of firms
A-Agriculture, forestry, and fishing	2,950	4.90 %
B-Mining and quarrying	309	0.50 %
C-Manufacturing	2,771	4.60 %
D-Electricity, gas, steam, and air conditioning supply	518	0.90 %
E-Water supply; sewerage, waste management, and remediation activities	214	0.40 %
F-Construction	7,764	13.00 %
G-Wholesale and retail trade; repair of motor vehicles and motorcycles	14,408	24.10 %
H-Transportation and storage	2,312	3.90 %
I-Accommodation and food service activities	2,337	3.90 %
J-Information and communication	2,479	4.10 %
K-Financial and insurance activities	3,415	5.70 %
L-Real estate activities	1,888	3.20 %
M-Professional, scientific, and technical activities	3,888	6.50 %
N-Administrative and support service activities	2,440	4.10 %
O-Public administration and defence; compulsory social security	160	0.30 %
P-Education	2,785	4.70 %
Q-Human health and social work activities	2,867	4.80 %
R-Arts, entertainment, and recreation	739	1.20 %
S-Other service activities	5,309	8.90 %
T-Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	145	0.20 %
U-Activities of extraterritorial organizations and bodies	116	0.20 %
Unknown	17	0.00 %
Total	59,831	100.00 %

Note: The table represents the share and number of firms by sector in the CIT dataset.

Source: The URA CIT panel technical note.

The number of firms in this table is significantly smaller than that in the full dataset. This is due to merging problems within the data creation process. The discrepancy arises because not all firms' returns could be matched to their registration information, as some may have de-registered or gone out of business. Thus, the data might not be available. The dataset and its documentation are an ongoing joint project by UNU-WIDER and URA.

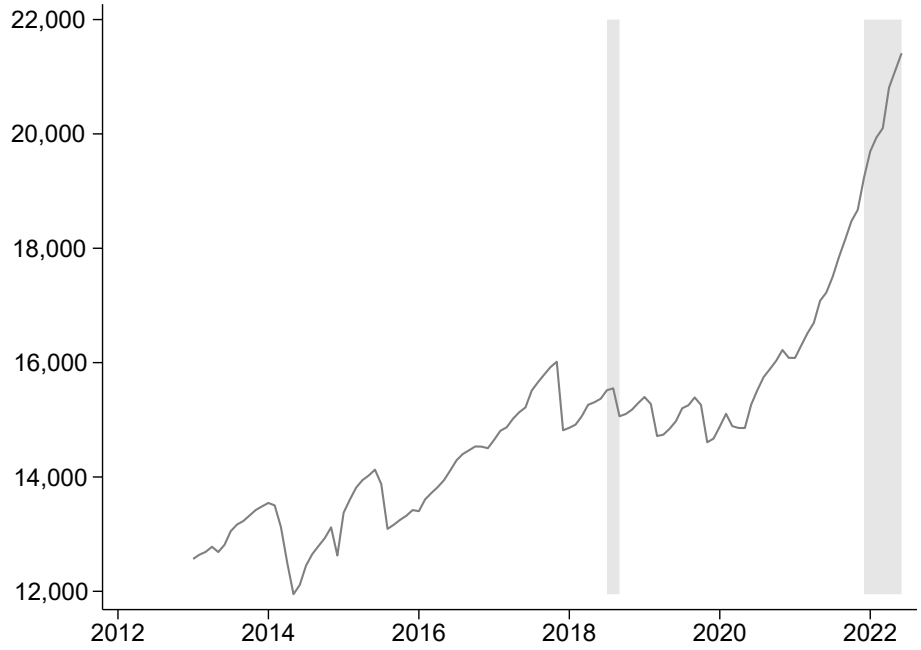
The VAT data consists mainly of self-reported values from the firm's tax returns, but it also includes some observations that have been audited. However, the number of these observations is relatively small. This means that the estimates and interpretation of the data consider only the reporting behaviour and changes in it rather than the actual economic activity. For example, an observed increase in reported inputs could result from two vastly different causes. The first cause could be that the firm is tax compliant and actually increased their inputs and reported them correctly, which can be seen in the data as increased inputs. The second cause could be that the firm starts over-reporting its inputs in order to minimize its VAT burden, which can also be seen in the data as increased inputs. The takeaway is that the observed effect is the effect on reporting. The actual economic action can be different. However, even though the logical direction for misreporting is the one which benefits the firm, Almunia et al. (2024) found that misreporting goes both ways, at least in Uganda, as discussed in Section 2.1.

Table 2: Share and number of firms in Kampala or other locations present in the CIT dataset

	# of firms
Kampala	32,297 (57.93 %)
Other	23,456 (42.07 %)
Total	55,753 (100.00 %)

Note: The table represents the share and number of firms by location in the CIT dataset.
Source: Author's calculations based on URA CIT panel technical note.

Figure 3: Number of firms filing VAT reports per month



Note: Grey areas highlight the two VAT withholding regimes.
Source: Author's illustration based on URA administrative tax data, 2024.

Figure 3 shows the number of firm–month pairs found in the dataset. The grey areas correspond to the two implementations of the VAT withholding regime. Additionally, two points in which the Electronic Fiscal Receipting and Invoicing Solution (EFRIS) reform was implemented are clearly visible in the graph, first in May 2020 with a pilot programme followed by a January 2021 rollout. The reform affects all VAT-registered firms equally and mandates the use of the platform, which submits electronic sales invoices automatically to the URA. (M. Jouste, personal communication, 13 March 2024)

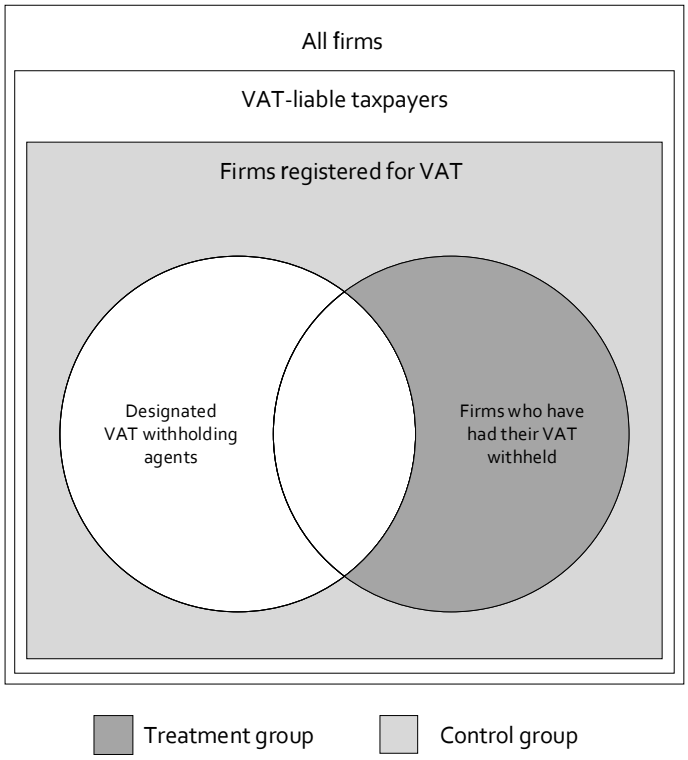
3.1 Control and treatment

The desired effect of a VAT withholding regime is to effectively force smaller companies to comply with the VAT setting by shifting the reporting responsibility from self-reporting to third-

party reporting. The effect this paper is interested in measuring is on the firms that have had their VAT withheld or, in other words, have sold products or services to the assigned withholding agents, who have, in turn, withheld the suppliers' VAT.

In practice, the assignment into the treatment and control groups began by identifying the firms that had reported their VAT withheld and the firms that had reported that they had withheld someone's VAT per month. Next, the firms were divided according to whether the withholding or being withheld happened during the first implementation of 2018 or the newer implementation which began in December 2021, or whether the firm was exposed to the regime both times. This is important because the impact of dealing with a withholding agent could expand to more than just the specific transactions. If the effect lasts even after ending trade with these withholding agents, the effect of getting one's VAT withheld again in the second implementation could be different to those who are having their first exposure to the withholding regime.

Figure 4: Graphical presentation of the control and treatment groups



Note: Groups not to scale.
Source: Author's own illustration, 2024.

After identifying the firms and on which side of the VAT withholding regime they operated, the next step is to assign the treatment and control groups. The treatment group is defined as reporting that their VAT was withheld at least once during the withholding regime at hand and as not being a designated withholding agent. Conversely, the control group is defined as having never reported that their VAT had been withheld but also not being a designated withholding agent. Effectively, the reason for this split is that we can examine the effect on similar groups of

firms, one of which should not be affected by the withholding regime and the other group from which we can measure the effect of being exposed to the regime by looking at the differences between the groups and the change in that difference. Figure 4 displays how the control and treatment groups are formed from the population of firms in Uganda.

3.2 Descriptive statistics

By examining the implementation in numbers, we can observe that its scope is quite limited. Of the 990 currently designated withholding agents, only around 500 reported that they had withheld someone's VAT per month during the latest withholding regime. In addition, URA lists 3,872 withholding-exempt taxpayers, of which 3,196 have an exemption for VAT withholding.[3] A list of designated VAT withholding agents and the withholding exemption list are publicly available on the URA website.

The implementation has not been very wide, and the number of firms affected by the regime is quite low. This, of course, makes it harder to identify any effect, but it could also mean that the treated firms are somewhat special in their field or location, which could affect the estimates and their external validity. In the tables below, we can observe the distribution of the treated and control group firms across fields, sizes, and locations.

Table 3: Number and share of firms located in Kampala or elsewhere by their treatment status used in multiple group and period DiD estimates

	Treatment status		
Location	**0**	**1**	**Total**
Kampala	14,537 (60.55 %)	1,756 (71.76 %)	16,293 (61.59 %)
Other	9,470 (39.45 %)	691 (28.24 %)	10,161 (38.41 %)
Total	24,007 (100 %)	2,447 (100 %)	26,454 (100 %)

Note: The table shows the number and share of firms by their treatment status in Kampala and other locations.
Source: Author's calculations based on URA administrative tax data, 2024.

First, as was the case with the full data, most of the VAT-registered entities are reported to be located in Kampala. Unlike in Table 2, I used the variable `c_businessdistrict` to construct Table 3, which is slightly different than the division in the technical note where `c_currentstationname` was used. However, when they are compared to each other, we can observe that the distribution shifts slightly towards Kampala when going from the full population to the control and treatment sample and looking even further into the treated sub-sample

[3] In addition to VAT withholding, Uganda enforces an income tax withholding regime; both are included in the list. An entity can be exempt from one or both withholding regimes.

we can see that the share shifts from 58 per cent of firms located in Kampala (Table 2) to almost 72 per cent of the treated firms located in Kampala (Table 3).

Table 4: Percentage of firms in ISIC sectors by their treatment status used in multiple group and period TWFE estimates

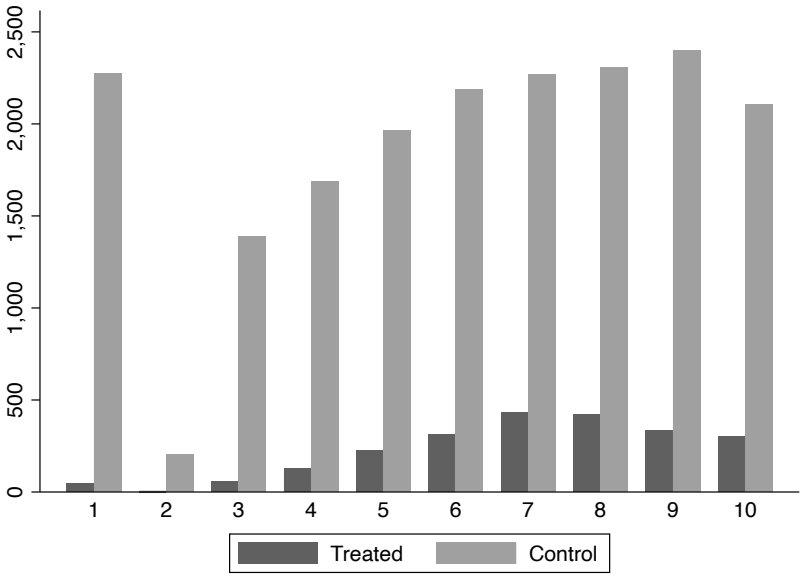
	Treatment status		
Current sector main activity	**0**	**1**	**Total**
A-Agriculture, forestry, and fishing	1.8%	0.9%	1.8%
B-Mining and quarrying	0.5%	0.6%	0.5%
C-Manufacturing	6.2%	8.4%	6.4%
D-Electricity, gas, steam, and air conditioning supply	1.1%	1.5%	1.1%
E-Water supply; sewerage, waste management, and remediation activities	0.4%	0.4%	0.4%
F-Construction	12.9%	11.6%	12.8%
G-Wholesale and retail trade; repair of motor vehicles and motorcycles	34.4%	27.2%	33.8%
H-Transportation and storage	4.0%	5.2%	4.1%
I-Accommodation and food service activities	4.6%	5.1%	4.7%
J-Information and communication	3.6%	6.5%	3.9%
K-Financial and insurance activities	1.1%	1.9%	1.2%
L-Real estate activities	4.4%	4.9%	4.4%
M-Professional, scientific, and technical activities	6.2%	9.7%	6.5%
N-Administrative and support service activities	3.1%	4.4%	3.3%
O-Public administration and defence; compulsory social security	3.4%	<0.4%	<3.1%
P-Education	0.2%	<0.4%	<0.2%
Q-Human health and social work activities	0.6%	0.6%	0.6%
R-Arts, entertainment, and recreation	0.7%	0.8%	0.8%
S-Other service activities	6.6%	8.0%	6.7%
T-Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	0.2%	<0.4%	<0.2%
U-Activities of extraterritorial organizations and bodies	0.1%	<0.4%	<0.1%
X-Missing	3.6%	0.7%	3.3%
Total	100.0%	100.0%	100.0%

Note: Samples of n<10 are reported as <10, and the total number of firms for these rows is reported as the upper bound. Samples of n<10 and percentage values are omitted for data privacy concerns. The number of missing or other values differs from Table 1 due to VAT-liable non-CIT registered entities.

Source: Author's calculations based on URA administrative tax data, 2024.

We can see that the distributions stay fairly similar when looking at the distribution across sectors in Tables 1 and 4. Some slight changes can be seen in, for example, manufacturing, which constitutes around 6.2 per cent of the control group and 8.4 per cent of the treatment group. Additionally, the wholesale sector has around 34.4 per cent of the control group and around 27.4 per cent of the treated group. Another finding worth highlighting is that the control group has around 3.6 per cent of missing sector designations, and the treated group only around 0.7 per cent. While diving more deeply into the reasons and targeting of the regime and which sectors and locations were more affected by it would be interesting, the methods used will mostly control for all of this as there does not seem to be a systematic difference across the groups.

Figure 5: Output distribution of treated and control firms



Note: Calculated from the full data as the mean of outputs before December 2021 and divided equally into deciles.

Source: Author's calculations based on URA administrative tax data, 2024.

Lastly, Figure 5 presents the distribution of the control and treated firms in deciles calculated by the mean output before December 2021 from the full population of firms in the VAT dataset. The size of a decile should be around 5,900 firms. There is some attrition from that number as firms stop doing business for any reason. Additionally, some growth in the number of firms happens as new businesses are registered to the dataset; both of these groups, those exiting and those emerging, are missing from the figure. Alongside attrition and growth, the firms filtered out due to the selection into control and treatment groups as discussed in Section 3.1 are also missing. Figure 5 shows that the control group has a significant amount of firms in the lowest decile, which are not present in the treated group. Looking at the bulk of the firms, we can observe that the number of firms in each decile grows relatively evenly in both the treated and control groups. The number of treated firms starts to decline after the eighth decile when the treated seem to have a slightly higher portion of firms in the highest deciles.

4 Empirical methods

The main method used to estimate the effect of the reform is a modern version of a differences-in-differences (DiD) estimation. DiD is a method which can be used to estimate a causal effect on an outcome variable where a randomized control trial is not viable. DiD requires control and treatment groups, which are allowed to be different in many ways but should conform to the main assumption in DiD called the parallel trends assumption (Angrist and Pischke 2014). Parallel trends refer to the idea that in the absence of treatment, the control and treatment groups would follow similar trends across time.

The intervention or treatment, in our context, having your VAT withheld, the effect of which is being estimated, should affect only the individuals in the treated group. The control group should remain unaffected. The average treatment effect on the treated (ATET) is then calculated by comparing the difference in the outcome variable before and after the treatment and the change in the control group. (Bertrand et al. 2004)

I am looking at three different outcome variables. Firstly, I am interested in the reported taxable output. This means the value of taxable sales by the firms and how that changes in the presence of the treatment. The change in output is the most direct effect, which could be measured from the VAT withholding treatment; if there were non-compliance, the VAT withholding would incentivize the treated firms to report their output to match the withheld amount. The second outcome variable is the reported taxable input, meaning the value of taxed purchases made by the firms, which could be used to offset the amount of tax. This should also increase, but as these firms have been VAT-liable before the implementation, it would have been beneficial for them to have been reporting inputs correctly or even over-report. The last outcome variable I am interested in is the total value added. This is the difference between the inputs and outputs or the value from which VAT is ultimately taxed. While compliance and reporting in the two other variables can increase, the one variable that is important for government revenue is this one. Any estimated increase in the total value added can be interpreted as an increase in tax revenue collection because of the implementation of the withholding regime. I use the original and log-transformed values for each of these specifications.

Threats to identification

In addition to the econometric identification problem, some of the threats lie with firm behaviour. Firms and individuals change their behaviour according to the policy changes made, which is what this and many other papers try to estimate. However, there are ways firms can change their behaviour, which is not captured in these estimates and can skew the results. I present two opposite effect threats to identification. The first potential threat to identification is that some supplying firms might respond to the VAT withholding regime by shifting to different (non-withholding) customers to avoid the administrative burden and potential cash flow disruptions associated with the regime. This could lead to an underestimation of the true impact of the policy on reported outputs and value added. Conversely, the withholding agents are mostly larger firms, including some in the public sector. Supplying to these agents might represent a larger contract than the company has previously had, potentially leading to increased scrutiny and a greater need for accurate VAT reporting. If the possible new trading partner and the withholding regime deployment coincide, this could result in an overestimation of the policy's impact.

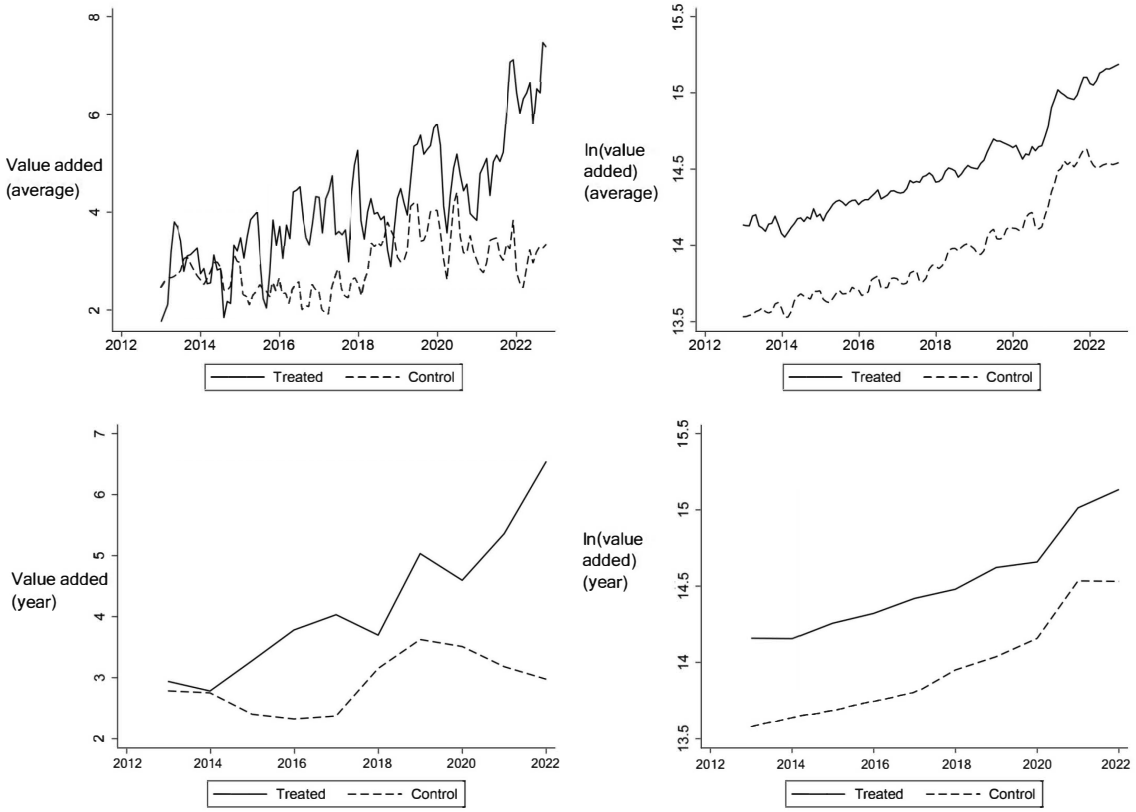
4.1 Multiple groups and multiple time periods

While the implementation of VAT withholding was sharp, meaning that it came into effect on a specific month for all, the data suggests that the take-up was more gradual and scattered. Since the general specification of DiD performs poorly, a two-way fixed effects (TWFE) model was chosen for the analysis. TWFE allows for much more leeway in the research design by allowing for a wider array of time- and group-fixed effects (Wing et al. 2018). For the usual specifications of a TWFE estimation, it is generally required that when the treated status is assigned to a unit, it should stay treated until the end of the time period; this is often referred to as 'treatment being an absorbing state'. However, in the setting of VAT and withholding, this doesn't hold. Nothing requires the firms to continue being exposed to withholding if they once get their VAT withheld.

Additionally, treatment can occur seasonally or otherwise in a non-continuous way. As highlighted by Roth et al. (2023), a conventional TWFE specification can and will typically make so-called 'forbidden comparisons', in addition to the 'clean' comparisons, which are between treated and not-yet-treated. The 'forbidden comparisons' are made between units that have both already been treated. While this is normal in a simple TWFE estimation, allowing for heterogeneous treatment effects can invalidate the estimates due to these 'forbidden comparisons'. This can lead to negative weights within the estimate, which can distort the results and, in some cases, even reverse the sign of the estimation.

By the recommendations of Roth et al. (2023), a two-way fixed effect estimator with heterogeneous treatment effects by de Chaisemartin and D'Haultfœuille (2020) was chosen. In addition to the specification allowing for multiple time- and group-fixed effects and even a non-absorbing treatment, it estimates heterogeneous dynamic effects, meaning that the units or firms in this setting do not have to respond the same way to the treatment in the following time periods. Further, the later specified model by de Chaisemartin and D'Haultfœuille (2024) was used. The Stata package `did_multiplegt` was deployed to conduct these estimates, allowing attrition and growth in the data as discussed in Section 3.2.

Figure 6: Value added pre-trends for treated and control firms



Note: Three-month averages and yearly means for values in millions of UGX and log-transformed values.
Source: Author's calculations based on URA administrative tax data, 2024.

4.2 Pre-trends

The most common way of testing the parallel trends assumption is to look at the pre-trends of the outcome variable. While the original specification for this assumption was quite strict, it can often be relaxed with modern DiD methods (Roth et al. 2023). Figures 6, 7, and 8 present four graphs each. The top graphs show the monthly aggregate trends as a three-month average and the bottom graphs show the yearly means of each variable. On the left, the values are presented in millions of UGX, and on the right, the values are log-transformed.[4]

For all of the dependent variables, these graphs show that at a monthly level, there is a high level of variance. Most of it is removed with a simple log transformation. For inputs, outputs, and value added, the aggregate log-transformed monthly and yearly levels are much more similar for the treated and control groups than when looking at the real value side of these graphs. What this suggests is that at least some of the variance and difference between these groups is an effect of some really high values, which the log transformation subdues.

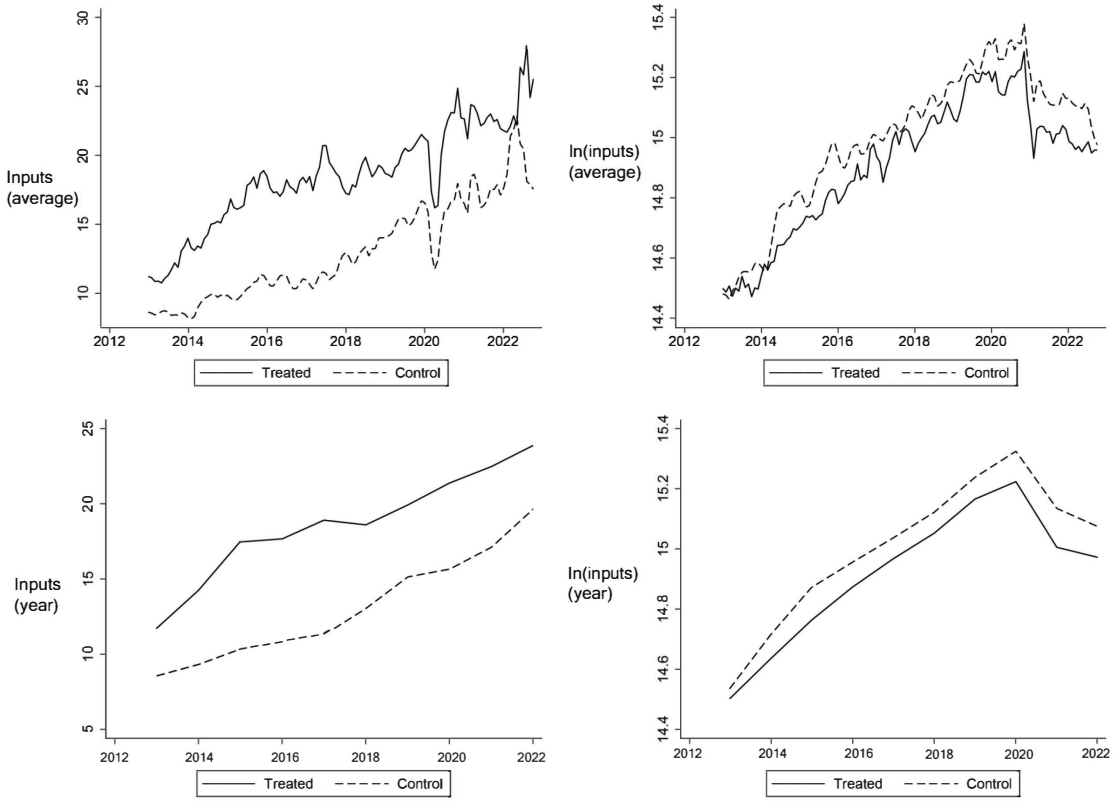
[4] Raw non-averaged graphs are presented in the appendix in Figures A1, A2, and A3.

While both the control and the treatment groups seem to fluctuate in a similar manner at the monthly level for inputs and outputs, a general difference in trends can be observed. The overall trends, more clearly visible in the yearly means, show the different trajectories of the groups from 2013 to 2018. A similar observation can be done for the value added in Figure 6, while the monthly variation is not as similar between the groups. This difference can have an impact on the validity of the estimates presented in Section 5. Some measures are taken in Section 6 to address these issues.

One important observation to be made is the sharp negative shocks located at the turn of the year from 2019 to 2020. This is quite certainly the result of COVID-19. As can be observed, the effects are very significant in inputs and outputs but mostly confounded in the value added levels. The log-transformed versions of these graphs show the turning point in the trends quite clearly. This can have implications for the causal estimates of this study. While the descriptive tables in Section 3.2 show no evidence of selection, it is not impossible that the firms in the treatment group differ systematically from those in the control group. This could mean that they react differently to the challenges presented by the pandemic. The shock happened in the pre-treatment period, almost 12 months before the actual implementation of the withholding regime. Hopefully, this reduces the possible confounding effects, but this caveat should be noted for internal and external validity concerns.

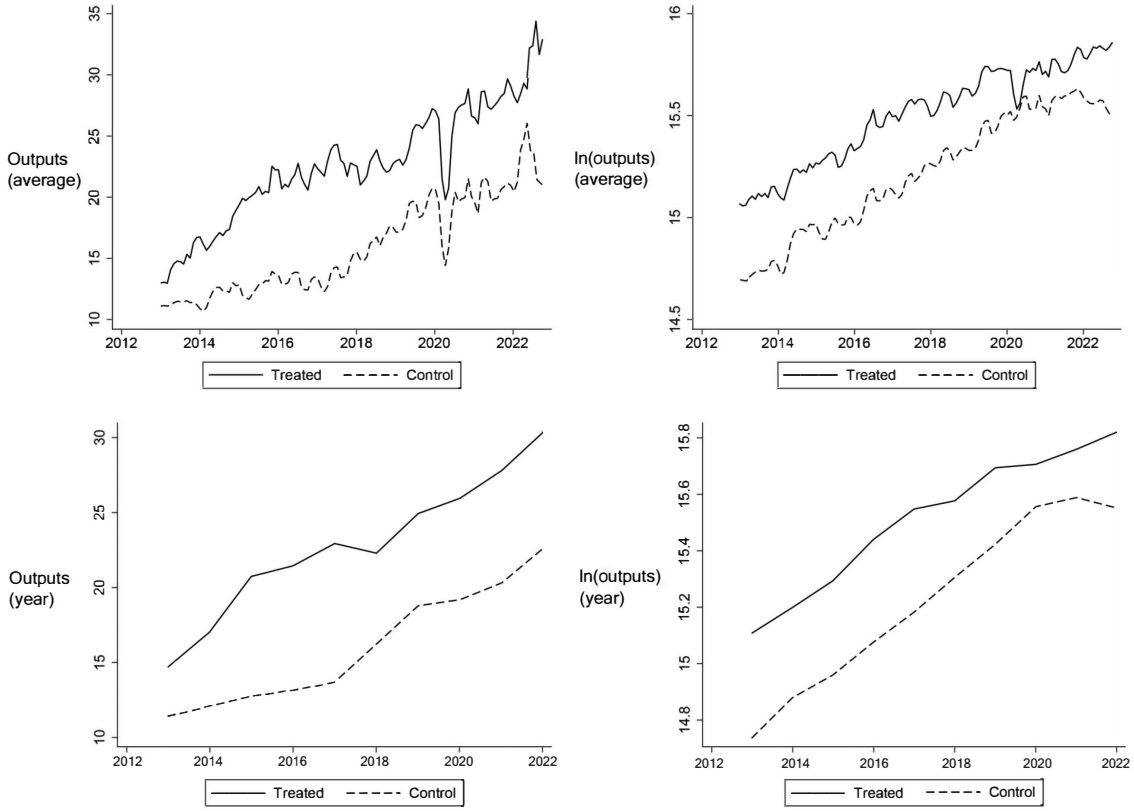
Lastly, the pre-treatment months in the figures and tables in Section 5 are so-called 'placebo estimates', which function as a form of parallel trends test. The pre-trends look reasonable for most of the linear models as presented in Figures 9 and 11. Still, when the dependent variables are log-transformed (Figures 10 and A4), they would suggest that there might be some problems with either anticipation or non-parallel pre-trends. However, given that the linear and log-transformed estimates are very similar, I would argue that the estimates are, at worst, indicative of what is present in the data.

Figure 7: Input pre-trends for treated and control firms



Note: Three-month averages and yearly means for values in millions of UGX and log-transformed values.
Source: Author's calculations based on URA administrative tax data, 2024.

Figure 8: Output pre-trends for treated and control firms



Note: Three-month averages and yearly means for values in millions of UGX and log-transformed values.
Source: Author's calculations based on URA administrative tax data, 2024.

5 Results

I present two tables; both include estimates for all three dependent variables of interest: inputs, outputs, and the value added. Value added represents the difference between inputs and outputs, which signifies a simplified estimate of the entities' taxable profit. All estimates were computed using the `did_multiplegt` package in Stata. The binary treatment status of the firms identified in the treatment group was allowed to switch on and off by their reported VAT withheld each month as expressed in Equation 1.

$$\begin{cases} T_t = 1, & \text{if VAT withheld}_t > 0 \\ T_t = 0, & \text{if VAT withheld}_t = 0 \end{cases} \tag{1}$$

For the main estimates, the sample of treated firms was truncated by only allowing those firms whose first treated month was approximately around the December 2021 implementation. The cut-off was chosen to be February 2021, or 10 months before the implementation, as there was a clear time period with no first-time treated firms between the first and second regimes. This means firms exposed to VAT withholding in the first implementation were excluded. All estimates are produced by grouping on an individual (firm) basis and with the `robust_dynamic` option, which specifies the specification from de Chaisemartin and D'Haultfœuille (2024).

The tables present a dynamic effect on each variable: inputs, outputs, and value added. Each table has estimates from 6 months before treatment to 6 months after the treatment. Values for –1 are omitted as they function as the reference point for the other coefficients. Standard errors are presented in parentheses under each coefficient. For the estimates in Table 5, the values are in millions of UGX. For Table 6, the estimations are calculated with log-transformed values, which means their estimates are log effects which, when exponentiated, give a multiplicative factor for a one unit increase; in our binary treatment case, the treatment effect. The table presents the multiplicative factors as e^{β}. Lastly, each table is accompanied by a figure illustrating the coefficients and the 95 per cent confidence intervals for each variable and all dynamic effects from month –6 to 6.

Table 5: Dynamic effects of VAT withholding on firms reporting (millions of UGX)

Time to treatment	Inputs	Outputs	Value added
-6	-1.919	0.668	2.586
	(1.859)	(1.265)	(1.902)
-5	-2.686	-0.274	2.412
	(2.144)	(1.121)	(1.515)
-4	-1.818	0.428	2.245
	(1.558)	(1.205)	(1.760)
-3	-2.313	0.950	3.263
	(1.832)	(1.060)	(1.529)
-2	-2.970	1.041	4.011
	(2.015)	(1.605)	(2.805)
-1	0	0	0
	(nan)	(nan)	(nan)
0	-3.099	4.618	7.717
	(1.899)	(1.402)	(1.684)
1	-3.648	-2.541	1.107
	(1.717)	(1.600)	(1.046)
2	-4.044	-2.935	1.108
	(1.762)	(1.862)	(1.501)
3	-6.362	-3.963	2.399
	(1.726)	(1.824)	(1.199)
4	7.734	8.406	0.672
	(15.045)	(6.694)	(1.091)
5	-3.255	-0.346	2.909
	(1.396)	(2.169)	(1.973)
6	-3.509	-2.737	0.771
	(1.880)	(1.975)	(1.807)

Note: Standard errors in parentheses.

Source: Author's calculations based on URA administrative tax data, 2024.

Table 5 and Figure 9 display the estimates of the most basic specification. The values are in millions of UGX. The coefficients of the reported inputs show a relatively steady, slightly negative level with statistically significant estimates in months 1, 2, and 3. The coefficient for period 0 is also negative and similar in magnitude, which differs from the estimates for outputs and value added. Outputs experience a statistically significant positive effect on $t = 0$. The estimated effect is around UGX4.6 million or approximately US$1,288.[5] The estimates for value added show an even higher effect of over UGX7.7 million or approximately US$2,156. While the pre-treatment months or so-called placebo estimates seem fairly stable for inputs and outputs, the positive and, on month –3, even statistically significant pre-treatment effect decreases the level of certainty for the magnitude of effect. The prominent spike in the confidence interval in month 4 raises some questions. Still, as it is only visible in inputs and outputs but not in value added, it is most likely an equal and same-sign shock to both inputs and outputs. The sudden increase in confidence intervals does not carry over to the log-transformed estimations, which would suggest that it is driven mainly by a smaller portion of firms reporting significantly higher inputs and outputs.

[5] Conversions made with the rate of UGX1 = US$0.00028. The conversion rate is an approximate rate during the implementation of the withholding regime.

Table 6 and Figure 10 present the estimates for a similar specification as Table 5 but with log-transformed dependent variables. Log inputs and outputs show a similar pre-trend with a clear and statistically significant negative placebo coefficient around months –5 and –4, which turns into a positive but insignificant estimate just before the reference month, –1. This implies that the control and treated groups differ significantly before the treatment for the log-transformed specification, and the parallel pre-trends do not hold. However, the coefficients for the log-transformed values tell a similar story as those in the previously discussed specification. Inputs show no apparent effect after treatment, and the outputs show a statistically significant positive effect of 0.164, or around 17.8 per cent, increase in reported outputs. However, as in the non-log-transformed values, the effect seems to be limited to just the first month after treatment. While Figure 9 shows a negative dynamic effect, the log transformation turns it into a slightly positive but statistically insignificant dynamic effect. When looking at the coefficients of the value added, a similar slightly negative pre-trend is observable. The immediate treatment effect point estimate is 0.3 or around 35 per cent increase in the estimated value added just after having one's VAT withheld. Surprisingly, a sustained dynamic effect of around 10 to 16 per cent emerges in this specification.

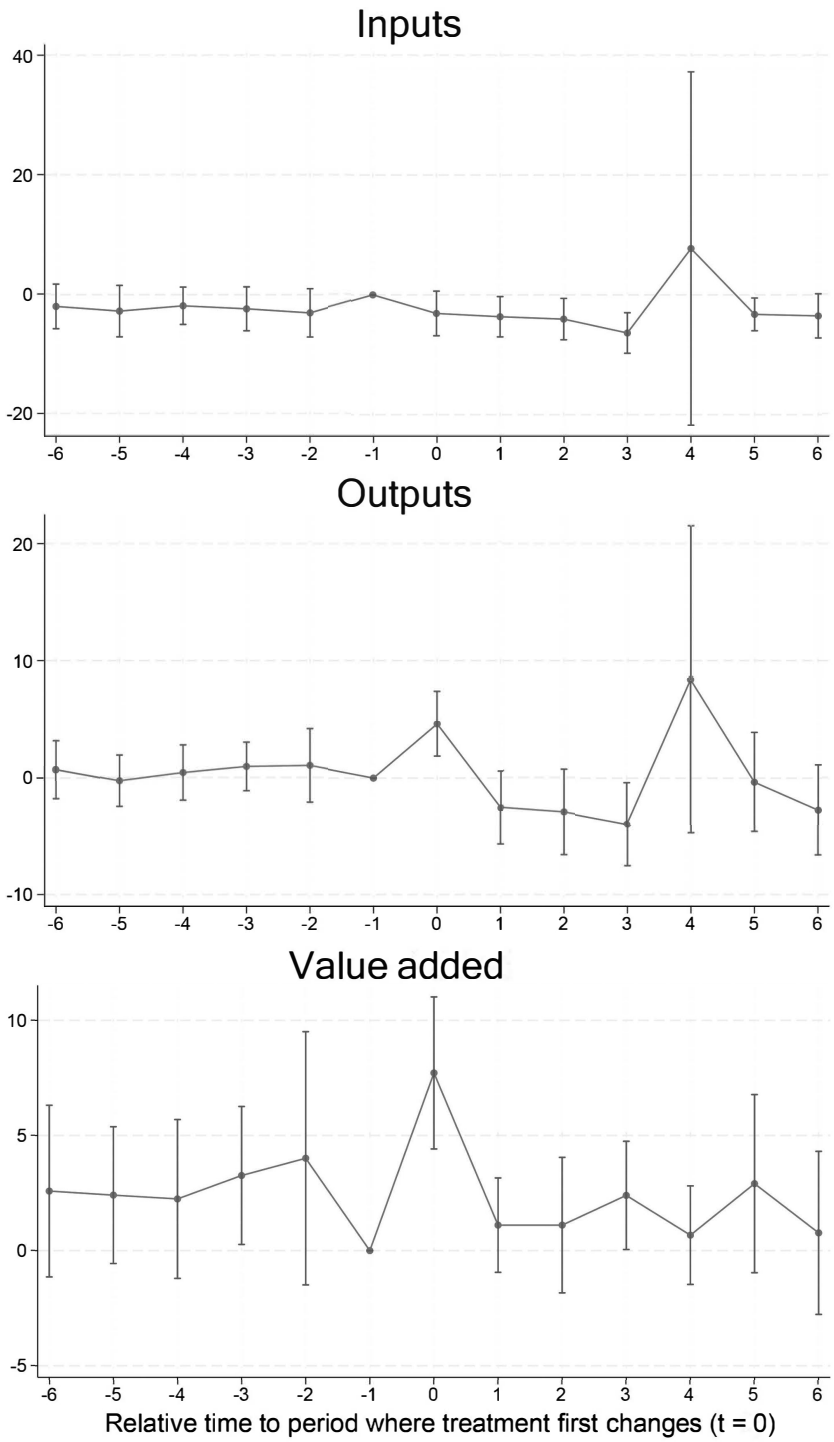
Table 6: Log dynamic effects of VAT withholding on firms reporting (e^{β})

Time to treatment	ln(inputs)	e^{β_I}	ln(outputs)	e^{β_O}	ln(value added)	$e^{\beta_{VA}}$
-6	-0.071	0.931	-0.043	0.958	0.004	1.004
	(0.059)		(0.024)		(0.064)	
-5	-0.076	0.927	-0.076	0.927	-0.043	0.958
	(0.059)		(0.031)		(0.043)	
-4	-0.125	0.882	-0.078	0.925	-0.036	0.965
	(0.041)		(0.029)		(0.043)	
-3	-0.025	0.975	-0.027	0.973	-0.075	0.928
	(0.049)		(0.018)		(0.044)	
-2	0.036	1.037	0.039	1.040	0.014	1.014
	(0.050)		(0.026)		(0.057)	
-1	0		0		0	
	(nan)		(nan)		(nan)	
0	0.013	1.013	0.164	1.178	0.300	1.350
	(0.051)		(0.019)		(0.052)	
1	-0.012	0.988	-0.026	0.974	0.068	1.070
	(0.040)		(0.022)		(0.061)	
2	-0.026	0.974	0.019	1.019	0.149	1.161
	(0.041)		(0.023)		(0.054)	
3	-0.084	0.919	0.035	1.036	0.152	1.164
	(0.033)		(0.022)		(0.051)	
4	-0.064	0.938	0.039	1.040	0.120	1.127
	(0.059)		(0.037)		(0.062)	
5	-0.046	0.955	0.027	1.027	0.089	1.093
	(0.048)		(0.027)		(0.048)	
6	-0.076	0.927	-0.019	0.981	0.123	1.131
	(0.059)		(0.030)		(0.052)	

Note: Standard errors in parentheses.

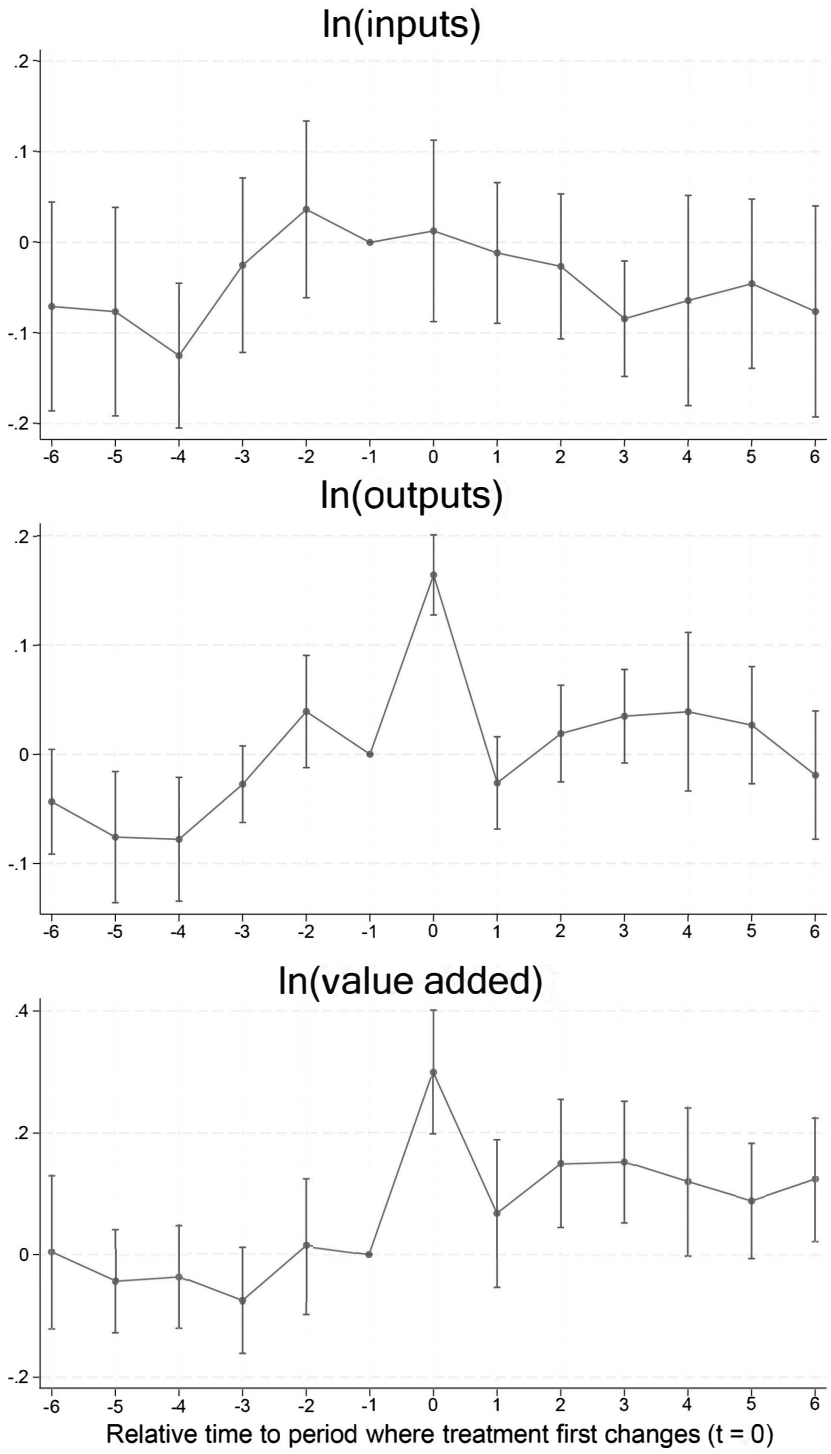
Source: Author's calculations based on URA administrative tax data, 2024.

Figure 9: Dynamic effects of VAT withholding on firms reporting (Table 5)



Source: Author's calculations based on URA administrative tax data, 2024.

Figure 10: Log dynamic effects of VAT withholding on firms reporting (Table 6)



Source: Author's calculations based on URA administrative tax data, 2024.

6 Robustness checks

As a robustness check, Tables 7 and 8 present coefficients from simple DiD estimates where the variable of staggered treatment times was taken out. This was done by selecting the month with the most first-time treatments that occurred, which was January 2022, and running only those individuals against the control group. Table 8 has additionally been restricted so that the top 5 per cent of firms were removed from the estimation sample to see if the big firms, whose reported values can be multitudes higher than the median firms, had a significant effect on the estimates. These non-dynamic estimations tell a very similar story to the dynamic effect estimates. Log outputs and value added show a statistically significant positive effect of about 11 per cent for outputs and 14 per cent for value added, and with the top 5 per cent of firms removed, the estimates grow to 12.4 per cent and 16 per cent, respectively.

While Tables 5 and 6 in the results section concern all changes in treatment status, Table 9 presents the estimates for only the first-time switchers who switch from not treated to treated. By excluding possible transitions from treated to untreated, the estimates in Table 9 aim to more accurately identify the effect of treatment on the dependent variables of interest. The difference is quite small when comparing Tables 5 and 9. Overall, the standard errors seem slightly larger for the more restricted specifications. This could be the consequence of the number of treatments being smaller and, thus, the number of treatment effects considered to be smaller. Another observation is that the estimates are systematically lower in the only untreated to treated estimates compared to the default estimates, meaning positive values are less positive and negative values are more negative. One explanation could be that the treated to untreated effect is somewhat negative, which drives the untreated to treated effect to be more positive.[6]

Table 7: DiD estimation results with one treatment period only

	ln(outputs)	ln(inputs)	ln(value added)	Outputs	Inputs	Value added
ATET						
Treated × post	0.104	0.092	0.131	2.510	1.277	1.233
	(0.031)	(0.049)	(0.035)	(2.345)	(2.804)	(1.394)
Observations	188,643	179,750	148,061	340,238	340,238	340,238

Note: Standard errors in parentheses. Observations are at firm–month level. Clustered on individual level and time-fixed effects applied.

Source: Author's calculations based on URA administrative tax data, 2024.

[6] This is duplicated with log-transformed dependent variables and the results are presented in Table A1 and Figure A4, which can be found in the appendix. The log-transformed coefficients show a similar trend but with higher variation in the direction of the difference in standard errors and estimates.

Table 8: DiD estimation results with one treatment period only without top 5 per cent

	ln(outputs)	ln(inputs)	ln(value added)	Outputs	Inputs	Value added
ATET						
Treated × post	0.117	0.111	0.150	3.424	2.430	0.994
	(0.033)	(0.051)	(0.036)	(1.677)	(2.190)	(1.217)
Observations	160,605	151,998	127,493	293,313	293,313	293,313

Note: Standard errors in parentheses. Observations are at firm–month level. Clustered on individual level and time-fixed effects applied.

Source: Author's calculations based on URA administrative tax data, 2024.

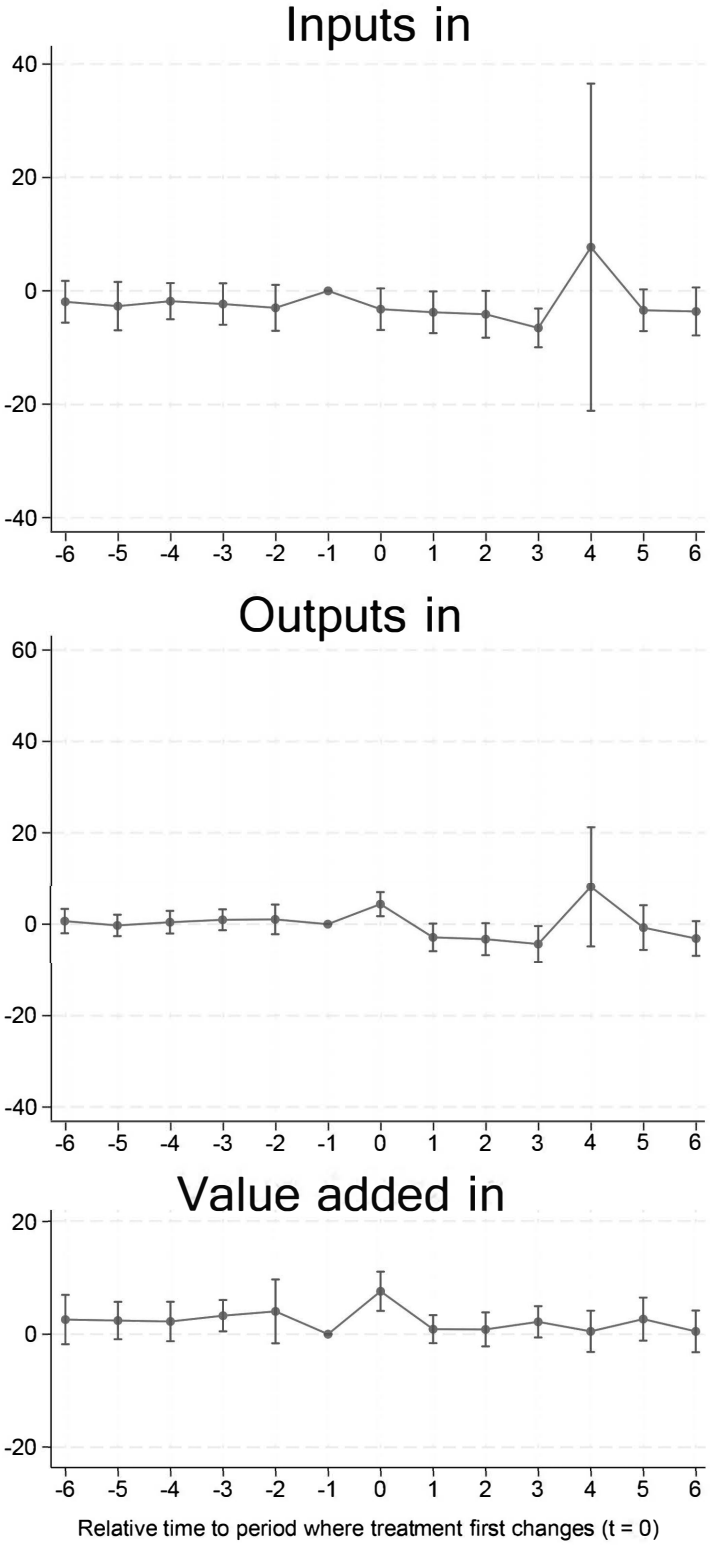
Table 9: Dynamic effects of VAT withholding on firms reporting, only untreated to treated (millions of UGX)

Time to treatment	ln(inputs)	ln(outputs)	ln(value added)
-6	-1.919	0.668	2.586
	(1.874)	(1.357)	(2.228)
-5	-2.686	-0.274	2.412
	(2.171)	(1.191)	(1.688)
-4	-1.818	0.428	2.245
	(1.624)	(1.260)	(1.780)
-3	-2.318	0.956	3.274
	(1.859)	(1.161)	(1.416)
-2	-2.990	1.042	4.032
	(2.063)	(1.650)	(2.884)
-1	0	0	0
	(nan)	(nan)	(nan)
0	-3.222	4.367	7.589
	(1.866)	(1.342)	(1.770)
1	-3.768	-2.880	0.887
	(1.873)	(1.537)	(1.267)
2	-4.120	-3.274	0.846
	(2.102)	(1.780)	(1.534)
3	-6.523	-4.337	2.185
	(1.737)	(2.004)	(1.413)
4	7.677	8.180	0.503
	(14.683)	(6.649)	(1.862)
5	-3.414	-0.747	2.668
	(1.873)	(2.488)	(1.945)
6	-3.620	-3.127	0.493
	(2.152)	(1.932)	(1.880)

Note: Standard errors in parentheses. Observations are at firm–month level. Clustered on individual level and time-fixed effects applied.

Source: Author's calculations based on URA administrative tax data, 2024.

Figure 11: Dynamic effects of VAT withholding on firms reporting, only untreated to treated (Table 9)



Source: Author's calculations based on URA administrative tax data, 2024.

7 Conclusions

Taxation is an essential mechanism for collecting government revenue. However, it is a difficult for this instrument to succeed in many developing contexts. Efficient taxation relies on either high levels of internal motivation to pay taxes or a credible monitoring and enforcement system. Both of these can be scarce in the developing world, not least in sub-Saharan Africa. While the underlying structures, institutions, and attitudes towards taxation still have difficulties, a lot of work has been put into implementing different tax regimes in Africa. One of the main driving forces for introducing VAT has been the International Monetary Fund. As VAT has increased in popularity across the world, its success has yet to be as evident in the developing world as compared to, for instance, Europe.

The prospects of a well-implemented and -run VAT regime are attractive for nations struggling to collect revenue to continue and support development. However, it has become evident that a widening tax base requires additional monitoring and enforcement resources, and success is not guaranteed. One intervention designed to increase compliance has been withholding VAT. With a wide adaptation in Latin America, it has also found its way into sub-Saharan Africa. Withholding VAT leans on the idea of third-party reporting, which eases monitoring by increasing cross-referenceable data. However, this also needs enforcement and monitoring resources to make it credible. With the increased burden on the firms selling to the designated withholding agents, the effect is not apparent.

I estimate the dynamic effects of a VAT withholding regime in Uganda on the basis of three key reported variables: inputs, outputs, and value added. The estimations are made using a modern two-way fixed effects method and administrative tax data from the Uganda Revenue Authority.

The regime has had a positive effect on the reported outputs and the estimated value added for the firms that have been affected by the withholding regime. I find an approximately 17.8 per cent increase or UGX4.62 million or around US$1,294 in the reported outputs on the first month after treatment. For the estimated value added, the effect is approximately a 35 per cent increase or UGX7.72 million or around US$2,162. The dynamic post-treatment effects suggest that the effect might not be persistent. However, no definitive conclusions on the non-immediate effects should be made as the uncertainties in parallel trends could affect the dynamic estimates. Despite these uncertainties, the immediate $t = 0$ point estimates should be robust, as they are very similar between the actual estimates, the untreated to treated estimates, and the single treatment-time estimates.

These results are quite similar to those found in Zambia by Adu-Ababio et al. (2023). In Uganda, the increase in reported outputs was 17.8 per cent, and the same effect in Zambia was 22 per

cent. On the other hand, the estimates for value added were significantly smaller in Zambia, at around a 7.3 per cent increase post-treatment when compared to the approximately 35 per cent increase in Uganda. This suggests that the firms might have responded to the increased reporting liability by strategically increasing their inputs accordingly, which does not seem to be the case for Ugandan firms, at least in the immediate to short term.

As is often the case, external validity is quite difficult to argue in development economics studies. Specific context and the heterogeneity of developing countries mean that findings from one context may not be directly applicable to another. In the case of this study, the non-random selection of withholding agents and, subsequently, the firms' selection into treatment group further complicate the issue. Firms subjected to VAT withholding were primarily those interacting with NGOs, financial institutions, governmental entities, and very large firms acting as withholding agents. While it is not obvious that selection bias is present, it cannot be ruled out, as the characteristics of the firms receiving treatment may differ systematically from those that do not, thus affecting the generalizability of the results.

References

Adhikari, B., Alm, J., and Harris, T. F. (2021). 'Small Business Tax Compliance Under Third-Party Reporting'. *Journal of Public Economics*, 203: 104514. **https://doi.org/10.1016/j.jpubeco.2021.104514**

Adu-Ababio, K., Koivisto, A., Kumwenda, A., Chileshe, G., Mulenga, J., Mebelo, M., Mufana, I., and Shamabobo, Y. (2023). 'Assessing the Impact of an Intervention to Withhold Value-Added Tax in Zambia'. Tech. Rep.. Helsinki, Finland: UNU-WIDER. **https://doi.org/10.35188/UNU-WIDER/2023/329-1**

Almunia, M., Hjort, J., Knebelmann, J., and Tian, L. (2024). 'Strategic or Confused Firms? Evidence from "Missing" Transactions in Uganda'. *The Review of Economics and Statistics*, 106(1): 256–265. **https://doi.org/10.1162/rest_a_01180**

Angrist, J. D., and Pischke, J.-S. (2014). *Mastering Metrics: The Path from Cause to Effect* (No. 10363). Princeton University Press.

Bertrand, M., Duflo, E., and Mullainathan, S. (2004). 'How Much Should We Trust Differences-in-Differences Estimates?' *The Quarterly Journal of Economics*, 119(1): 249–275. **https://doi.org/10.1162/003355304772839588**

Bird, R., and Gendron, P.-P. (2007). *The VAT in Developing and Transitional Countries*. Cambridge University Press. **https://doi.org/10.1017/CBO9780511619366**

Carrillo, P., Pomeranz, D., and Singhal, M. (2017). 'Dodging the Taxman: Firm Misreporting and Limits to Tax Enforcement'. *American Economic Journal: Applied Economics*, 9(2): 144–64. **https://doi.org/10.1257/app.20140495**

de Chaisemartin, C., and D'Haultfœuille, X. (2020). 'Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects'. *American Economic Review*, 110(9): 2964–96.

https://doi.org/10.1257/aer.20181169

de Chaisemartin, C., and D'Haultfœuille, X. (2024). 'Difference-in-Differences Estimators of Intertemporal Treatment Effects'. *The Review of Economics and Statistics*, 1–45. **https://doi.org/10.1162/rest_a_01414**

Ernst & Youg LLP (2018). 'Uganda Introduces VAT Withholding'. News, 9 August. Ernst & Young LLP. Available at: **https://globaltaxnews.ey.com/news/2018-5960-uganda-introduces-vat-withholding**

Jahnke, B. (2017). 'How Does Petty Corruption Affect Tax Morale in Sub-Saharan Africa?'. Tech. Rep.. Helsinki, Finland: UNU-WIDER. **https://doi.org/10.35188/UNU-WIDER/2017/232-8**

Keen, M. (2009, March). 'What Do (and Don't) We Know About the Value Added Tax? A Review of Richard M. Bird and Pierre-Pascal Gendron's The VAT in Developing and Transitional Countries'. *Journal of Economic Literature*, 47(1): 159–70. **https://doi.org/10.1257/jel.47.1.159**

Mawejje, J., and Sebudde, R. K. (2019). 'Tax Revenue Potential and Effort: Worldwide Estimates Using a New Dataset'. *Economic Analysis and Policy*, 63: 119–129. **https://doi.org/10.1016/j.eap.2019.05.005**

Mkandawire, T. (2010). 'On Tax Efforts and Colonial Heritage in Africa'. *The Journal of Development Studies*, 46(10): 1647–1669. **https://doi.org/10.1080/00220388.2010.500660**

Najjinda, J. (2021). 'What the Re-Introduction of Withholding VAT Means for Your Business'. Press room, 19 November. PwC Uganda. Available at: **https://www.pwc.com/ug/en/press-room/re-introduction-of-withholding-vat.html**

North, D. C., Wallis, J. J., and Weingast, B. R. (2009). *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History*. Cambridge University Press.

Roth, J., Sant'Anna, P. H., Bilinski, A., and Poe, J. (2023). 'What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature'. *Journal of Econometrics*, 235(2): 2218–2244. **https://doi.org/10.1016/j.jeconom.2023.03.008**

Tieu, Q., Jouste, M., Nakyambadde, D., and Koivisto, A. (2023). *The Uganda Revenue Authority Value-Added Tax (VAT) Panel Data.* Helsinki: UNU-WIDER.

Torgler, B., Martinez-Vazquez, J., and Bird, R. (2011). 'Societal Institutions and Tax Effort in Developing Countries'. *CREMA Working Paper*, 2004-21. **http://dx.doi.org/10.2139/ssrn.662081**

Uganda Revenue Authority (2023a). *The Uganda Revenue Authority Trade Data (version 1).* Kampala: Uganda Revenue Authority.

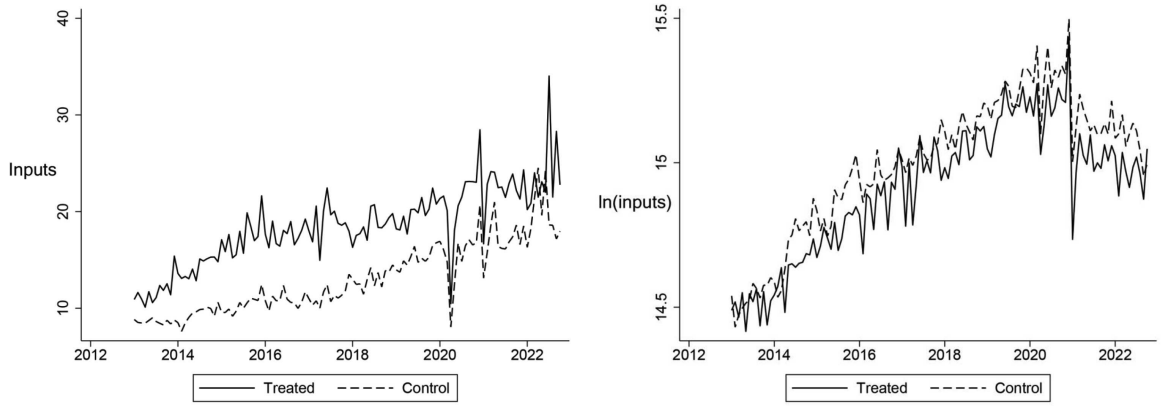
Uganda Revenue Authority (2023b). *The Uganda Revenue Authority Value-Added Tax (VAT) Panel Data (version 1).* Kampala.

UNU-WIDER (2023). 'UNU-WIDER Government Revenue Dataset'. Version 2023. Helsinki: UNU-WIDER. **https://doi.org/10.35188/UNU-WIDER/GRD-2023**

Wing, C., Simon, K., and Bello-Gomez, R. A. (2018). 'Designing Difference in Difference Studies: Best Practices for Public Health Policy Research'. *Annual Review of Public Health*, 39(Volume 39, 2018): 453–469. **https://doi.org/10.1146/annurev-publhealth-040617-013507**

Appendix

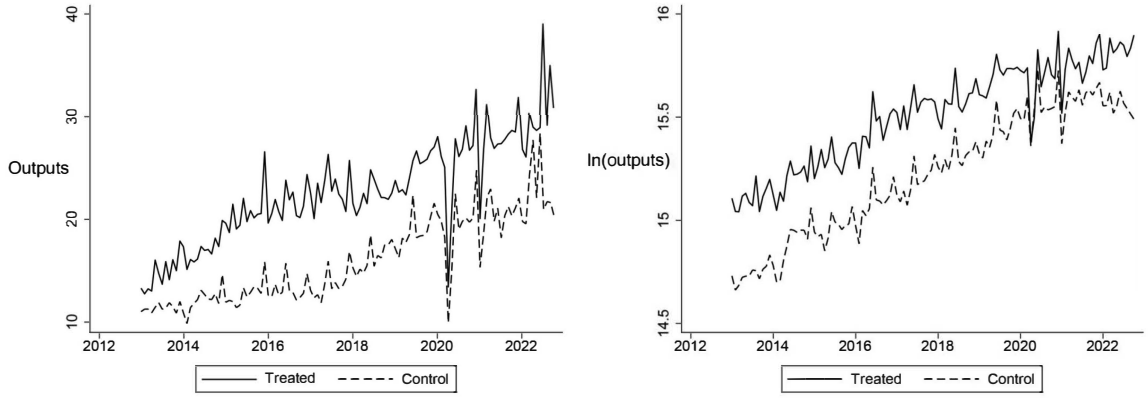
Figure A1: Input pre-trends for treated and control firms



Note: Monthly means, values in millions of UGX and log-transformed values.

Source: Author's calculations based on URA administrative tax data, 2024.

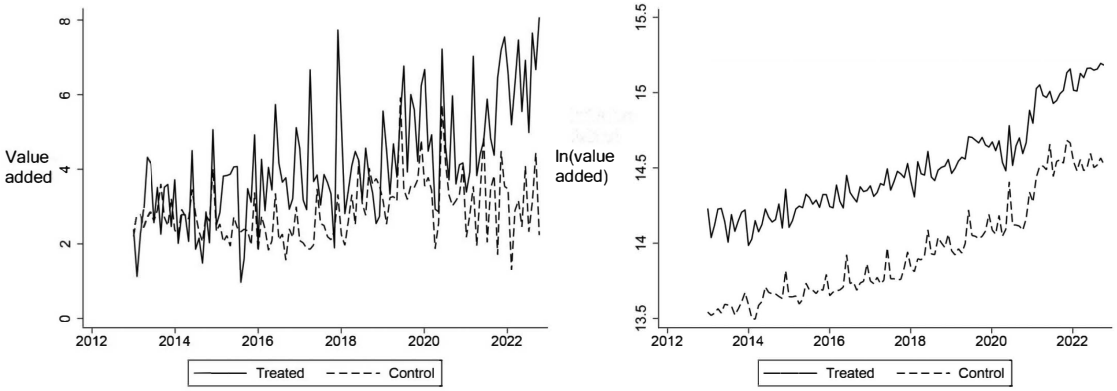
Figure A2: Output pre-trends for treated and control firms



Note: Monthly means, values in millions of UGX and log-transformed values.

Source: Author's calculations based on URA administrative tax data, 2024.

Figure A3: Value added pre-trends for treated and control firms



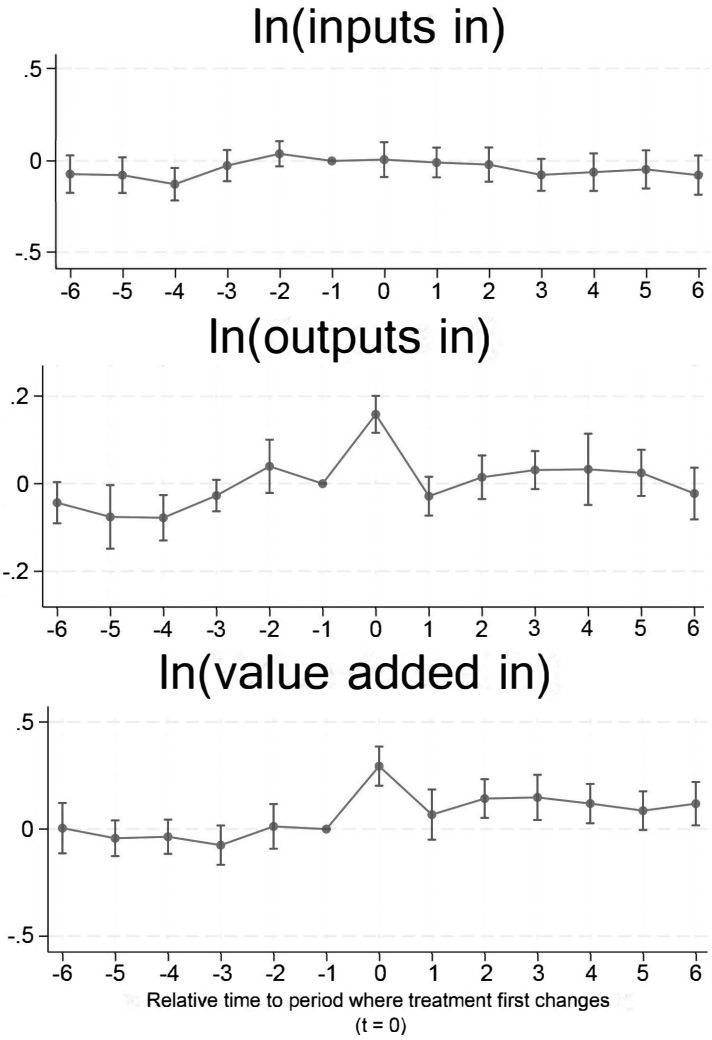
Note: Monthly means, values in millions of UGX and log-transformed values.
Source: Author's calculations based on URA administrative tax data, 2024.

Table A1: Log dynamic effects of VAT withholding on firms reporting, only untreated to treated (e^{β})

Time to treatment	ln(inputs)	e^{β_I}	ln(outputs)	e^{β_O}	ln(value added)	$e^{\beta_{VA}}$
-6	-0.071	0.931	-0.043	0.958	0.004	1.004
	(0.051)		(0.024)		(0.060)	
-5	-0.076	0.927	-0.076	0.927	-0.043	0.958
	(0.049)		(0.037)		(0.043)	
-4	-0.125	0.882	-0.078	0.925	-0.036	0.965
	(0.044)		(0.026)		(0.041)	
-3	-0.025	0.975	-0.027	0.973	-0.075	0.928
	(0.043)		(0.018)		(0.047)	
-2	0.038	1.039	0.040	1.041	0.012	1.012
	(0.034)		(0.031)		(0.053)	
-1	0		0		0	
	(nan)		(nan)		(nan)	
0	0.007	1.007	0.158	1.171	0.294	1.342
	(0.048)		(0.021)		(0.047)	
1	-0.008	0.992	-0.029	0.971	0.068	1.070
	(0.041)		(0.023)		(0.060)	
2	-0.020	0.980	0.015	1.015	0.143	1.154
	(0.047)		(0.025)		(0.046)	
3	-0.075	0.928	0.031	1.031	0.148	1.160
	(0.044)		(0.022)		(0.054)	
4	-0.060	0.942	0.033	1.034	0.119	1.126
	(0.051)		(0.042)		(0.047)	
5	-0.046	0.955	0.025	1.025	0.086	1.090
	(0.052)		(0.027)		(0.046)	
6	-0.076	0.927	-0.023	0.977	0.119	1.126
	(0.054)		(0.030)		(0.052)	

Note: Standard errors in parentheses. Observations are at firm–month level. Clustered on individual level and time-fixed effects applied. Source: authors' compilation based on data.

Figure A4: Log dynamic effects of VAT withholding on firms reporting, only untreated to treated (Table A1)



Source: Author's calculations based on URA administrative tax data, 2024.